CYCLES OF EMPLOYMENT AND UNEMPLOYMENT IN THE UNITED STATES, 1903–1914

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In the first of these articles on employment and the business cycle,[1] a current index of employment in the United States was proposed, extending from the outbreak of the war to date. A half-dozen or more employment and unemployment series were examined, but only two were found to have all the characteristics naturally expected of a reliable current index. Accordingly, a combination of these two— properly corrected for seasonal variation, etc.—was proposed as a good index for present use, extending back far enough into the past to afford an adequate basis for the interpretation of current fluctuations. These two series were found to be strongly supported by the others. The high order of correspondence is shown by the correlation coefficients: the United States Bureau of Labor Statistics with the New York State Industrial Commission series (1915–21) +95 per cent; an adjusted combination of these two, with the Wisconsin series (1915–21) +98 per cent; the adjusted combination, with the Massachusetts employment series (1914–20) +80 per cent; adjusted series representing Massachusetts employment and unemployment (1914–20) −89 per cent.[2] The general employment index was found to bear striking relationships to military mobilization and demobilization, and to Day's monthly index of the production of manufactures, corrected for the varying length of month. The correlation between industrial employment and production was found to be 96 per cent.[3]

The purpose of this second article is: (1) to present an index of employment applicable to general industrial conditions in this country in the ten or fifteen years before the war; (2) to check up this index with the United States Censuses of Manufactures; and (3) to compare employment with direct measures of production before the war. The method utilized is, as before, the index method, without reference to that somewhat illusory concept, "the quantity of unemployment."

The two best employment series now current are of no assistance in studying pre-war relationships, not having been begun until early in

[1] This JOURNAL, vol. XVIII, pp. 42–55, Mar., 1922.

[2] Coefficients were not computed for the shorter series, such as that of the U. S. Employment Service.

[3] Since the writing of the first article, in January, Professor Day has tentatively estimated and eliminated the seasonal variation of his production series. His new results, compared with the adjusted employment index, appear in the *Harvard Economic Service*, vol. I, p. 73, *Weekly Letter* no. 13, Mar. 25, 1922. The correlation with his new series is also 96 per cent.

the war. Three other bodies of evidence are available which are similar in their nature, relating to the numbers employed in manufacturing establishments. These have been collected by the United States Census of Manufactures and by the state bureaus of statistics in New Jersey and Massachusetts. Furthermore, two unemployment series collected by the state bureaus in New York and Massachusetts are of assistance in constructing a general pre-war index of employment. Our first task is a critical review of these five bodies of evidence.

DIRECT MEASURES OF EMPLOYMENT

Employment data for Massachusetts.—Since 1889 the Massachusetts Bureau of Statistics has collected, early in each year, data showing the number of wage-earners on pay-rolls at the middle of each month during the preceding year in the most important manufacturing establishments of the state. The results have been published in the *Annual Reports on the Statistics of Manufactures*.[1] The aggregate number of wage-earners covered by these reports has ranged from 150,000 to 800,000. Although the data are very comprehensive they have not remained equally so throughout the period. Thus in 1899 about 360,000, or 82 per cent of the 438,000 wage-earners shown by the United States Census for Massachusetts, were covered by the reports of the state bureau; by 1904 the number had risen to 430,000 or 88 per cent, and in recent years it has become even larger.[2]

An important peculiarity of manufacturing in Massachusetts is the degree of industrial specialization, particularly in the manufacture of cotton goods. Cotton manufacturing forms between 16 and 26 per cent of the total manufacturing in the state, as contrasted with the figure of 6 per cent representing the quota of the cotton industry in the entire country. In other words, about 30 per cent of the country's cotton manufacturing is carried on in Massachusetts.[3] The boot and shoe industry also ranks high, constituting 10 to 16 per cent. Woolen and worsted goods, and foundry and machine-shop products, are groups of about equal importance, each employing 7 to 12 per cent of the total number of wage-earners. These four industrial groups comprise 40 to 55 per cent of all manufacturing in Massachusetts. Industrial specialization is one factor which renders the Massachusetts returns imperfectly representative of general industrial conditions. Moreover,

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[1] The figures for 1919 and 1920 were kindly supplied by Mr. Roswell F. Phelps, Director of the Bureau. Those for 1921 have not yet been tabulated.

[2] It is impossible to determine precisely the degree of inclusiveness after 1904, because in the subsequent census years the Bureau adopted outright the federal bureau's figures for Massachusetts; but the percentage appears to have risen decisively, perhaps to 95 per cent or even higher.

[3] Compare U. S. Census of Manufactures, 1914, *Abstract*, pp. 29–56, and the *Annual Report* of the Massachusetts Bureau, 1914, p. 52.

cotton manufacture, the most important of all, is wholly dependent upon agriculture for its raw material. This is another disadvantage, because an especially large or an especially small cotton crop seriously affects the response of this industry (and therefore the aggregates for Massachusetts) to the business cycle.[1]

Another objection to the Massachusetts data lies in their discontinuity during the past sixteen years. Prior to 1906 the data published yearly covered identical establishments over a period of twenty-four months, so that the actual degree of change in these establishments between each December and the following January could readily be ascertained. This policy of "overlapping" the yearly reports was not maintained after 1906, and consequently the problem of building up a reliable continuous series is not an easy one. After 1906 the data do not form a true statistical series at all, but a series of floating fragments, unconnected with each other. As a local census of manufactures, year by year, these Massachusetts data are excellent; but as a continuous record of employment fluctuation they cannot safely be accepted without reservations.

Employment data for New Jersey.—From 1895 through 1918, the New Jersey Bureau of Industrial Statistics collected data very similar to the Massachusetts data, publishing them in its *Annual Reports*.[2] The scope of the materials, limited to about 50,000 wage-earners in 1895–97, was considerably enlarged in subsequent years, ranging from 140,000 in 1898 to 320,000 in 1914.[3] Here as in Massachusetts the canvass did not cover a fixed proportion of establishments, nor even a steadily increasing proportion. Thus, in 1899 an average of 175,000 wage-earners was represented, *i. e.*, 82 per cent of the number shown by the federal census of manufactures; the ratio fell to 77 per cent in 1904, then rose to 87 per cent in 1909, and 88 per cent in 1914. New Jersey, unlike Massachusetts, is industrially diversified: the machinery and metal-working industries are fairly strong, as is natural in a state situated so near to iron and coal resources; but silk, wool, tobacco, and several others also rank comparatively high. It is noteworthy that cotton ranks eleventh, representing only about 2 per cent of all New Jersey's manufacturing.

[1] Another disadvantage is the importance of women workers in the industries of Massachusetts—about 40 per cent in cotton goods, 32 per cent in boots and shoes and in woolen and worsted goods, and 25 per cent in paper manufacture. The employment of juveniles, to the extent of about one eighth of the grand total, also makes the returns less reliable than if they related solely to adult male bread-winners.

[2] The data for the years 1895–1916 were obtained from these reports. Those for 1917 and 1918 were made available through the courtesy of Mr. J. A. T. Gribbin of the Bureau. The series was discontinued in 1918, though of course the federal census will presently show 1919 data for New Jersey.

[3] The number rose rapidly during the war to a half-million and more, owing chiefly to the growth in the manufacture of munitions, explosives, and chemicals in that state.

Census data on employment.—Monthly figures of a nature similar to the two sets just described are available also for the United States as a whole, but only for the quinquennial census years. Despite their disconnected character they have seemed worthy of analysis, since they cover 5,000,000 to 9,000,000 workers and offer promise as supporting evidence. The first monthly data available from this source were collected in 1899, but unlike the subsequent censuses this first set included hand trades and neighborhood industries, and have never been corrected on a basis comparable with the others.[1]

The essential homogeneity of the census data after the 1899 Census may be seen in the figures showing industrial composition.[2] The most important industrial group in the country as a whole is the combination of textiles and their products, which form about 21 per cent of the total, as measured by the number of wage-earners. The second in order of rank among the fourteen standard groups is iron and steel, which alone forms about one sixth of the aggregate and when combined with the three kindred groups—railroad repair shops, vehicles for land transportation, and metals and metal products other than iron and steel—forms a quota considerably more than one fourth. Lumber comprises about one eighth, and several other groups—namely, food and kindred products, paper and printing, and stone, clay, and glass products—4 to 7 per cent each. Each of these industries has maintained its quota in a fairly stable manner throughout the period 1899–1914. In not more than two or three cases (vehicles for land transportation, railroad repair shops, and the miscellaneous group) has there been any appreciable increase, while in only two cases (lumber and its products, and leather and its products) has there been a decline. In all the other groups, quotas have remained practically constant.[3] The industrial distribution has clearly remained sufficiently stable from census to census to justify regarding the data as industrially homogeneous.

PRELIMINARY ANALYSIS OF EMPLOYMENT DATA

In the first method of analyzing these three groups of employment data, no assumption whatever was made as to the change between years; the data were regarded as reliably measuring only the course of developments *within* a calendar year. The effects of seasonal variation and of secular trend were eliminated as well as possible by a special method, in such a way as to show the status of the employment cycle

[1] See the *Abstract of Manufactures*, 1914, p. 435. Although the Census Bureau appears to have revised its "representative date" figures to exclude these extraneous industries, the monthly data have never been so re-worked. It is understood that the Bureau, under the direction of Dr. Leo Wolman, is now planning to make such a re-computation.

[2] *Abstract of Manufactures*, 1914, p. 29.

[3] No data on the industrial distribution at the census of 1919 are yet available.

in any month as compared with January of the current year. This method involved four steps, the first two of which are suggested by Persons' analysis of seasonal variation in *continuous* series. The procedure involved: (1) computing the month-to-month link relatives, except, of course, for $\left(\frac{\text{January}}{\text{December}}\right)$; (2) taking the median of all the $\left(\frac{\text{February}}{\text{January}}\right)$ links as indicating the normal combined influence of seasonal variation and secular trend between January and February, and correspondingly the median for $\left(\frac{\text{March}}{\text{February}}\right)$, etc.; (3) subtracting from each actual link relative the corresponding median, yielding a percentage which should indicate the net effect of the business cycle between the two months; (4) finally, compounding the links into chain relatives with January of the current year as 100 per cent.

This method was first applied to the Massachusetts and the New Jersey data, yielding a series of fragments, one for each year. As an experiment, the method was also applied tentatively to the census data, though without great hope of success, because the sets of link relatives available for determining the normal month-to-month movements numbered only three. The 1919 data had not become available, and, as already explained, those for 1899 were not comparable; only those for 1904, 1909, and 1919 were available for use.

The need of relying upon three link relatives for determining the median did not result in such great inaccuracy as had been expected. In order to show the probable reliability of this rough method, experiments were made with the median link relatives, based first upon the eleven years 1903–13 and then upon the three census years for comparison. These sets of *median* link relatives were then joined together with January as 100. An illustration of the result is shown in Chart 1; the curves represent the normal effects of seasonal variation combined with secular trend on the New Jersey data. These experiments indicated that the median of three links is not hopelessly inaccurate; indeed it appears to be fairly reliable as a first approximation to the normal movements within the year. Accordingly, this method was applied to the census data for all states and all industries combined, and the resulting fragments compared with those derived from the state data for New Jersey and Massachusetts. Chart 2 shows these results for the census years.[1]

After the elimination of trend and seasonal variation, the cyclical elements present in the three sets of employment data are found strikingly similar. In amplitude, as in form, the three indexes agree

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[1] The recently tabulated data for 1919 have just been placed in the writer's hands through the courtesy of Dr. Joseph A. Hill, Assistant Director of the Census.

CHART 1
GENERAL EFFECT OF SEASONAL VARIATION AND
LONG-TIME TREND COMBINED, ON EMPLOYMENT
IN NEW JERSEY
(JANUARY = 100 PERCENT)
— — Based on 5 sets of link relatives
——— Based on 11 sets of link relatives

CHART 2
FRAGMENTS OF EMPLOYMENT CYCLES DURING
CENSUS YEARS
(JANUARY OF CURRENT YEAR = 100 percent)
——— U.S Census of Manufactures   — — Massachusetts Bureau
.... New Jersey Bureau
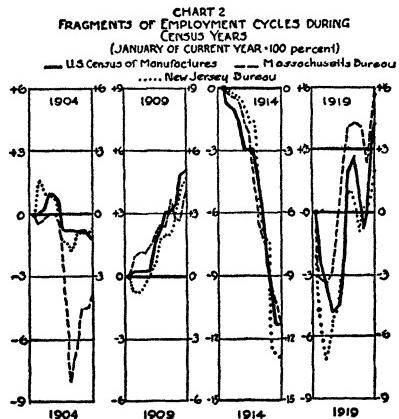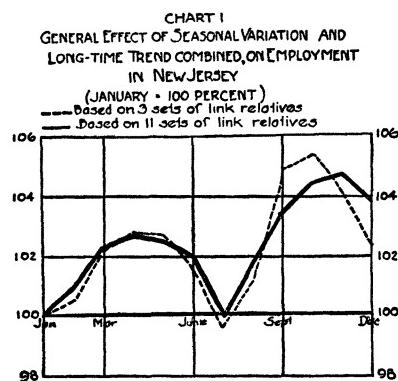
CHART 3
CURRENT EMPLOYMENT INDEX COMPARED WITH UNITED STATES CENSUS DATA
(UNIT: ONE PERCENT)
——— Current index, adjusted   .... U.S Census data, adjusted.
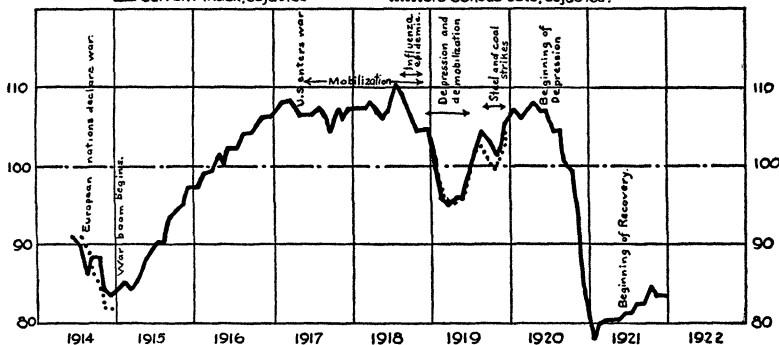
very well in the three later years, though less well in 1904. In 1909 all three rose about 5 per cent above the January base; in 1914 all three fell between 10 and 12 per cent; and in 1919, the depression just after the Armistice, the subsequent recovery, and, in the last quarter, the steel and coal strikes, appear unmistakably in all three curves.

The erratic behavior of the employment indexes in 1904 is not a feature peculiar to themselves, but is found also in other industrial barometers, such as pig iron production. Study of the various trade papers in 1904 also indicates clearly that after the "rich men's panic" of 1903 two recoveries occurred in succession. The first, an abortive one, took place in the first half of the year, and was followed by a distinct slump. Then came the much more substantial recovery, be-

ginning late in 1904 and continuing for two years or more. This reflex action seems to stand unparalleled in the annals of American business. It is not unnatural that some dissimilarities of behavior should appear in a year characterized by such reversals of the industrial machine. The three indexes differ chiefly in their verdict as to the severity of the intervening relapse. Apparently it was felt more severely and was followed by a slower recovery in Massachusetts than in either New Jersey or the United States as a whole.[1]

The new 1919 Census returns enable us to check up the corrected post-war index presented in the March JOURNAL.[2] The current index covers only about 1¼ millions, the census 9 millions of wage-earners; but the two when corrected for seasonal variation show a correlation of 97 per cent. The curves in Chart 3, as in the one representing pre-war results, manifest a strong similarity in both form and amplitude. This evidence goes far to support the current index as a trustworthy barometer of current industrial employment.

FORMATION OF CONTINUOUS EMPLOYMENT INDEXES

The strikingly clear and decisive form of these cyclical fragments naturally raises the question whether any hypothesis can be applied which will make possible some form of adjustment that will enable one to join the fragments together in a continuous record of employment cycles in Massachusetts and New Jersey. Of the several hypotheses which have been tested, the best involves: (1) adoption of the data of the United States Census of Manufactures for Massachusetts and for New Jersey, as "abutments" upon which to adjust the respective state bureaus' data; (2) complete reliance upon the state bureaus' data as to the percentage changes in employment during each intercensal calendar year; and (3) the adoption of a standard or normal link relative to connect each December to the following January, on the assumption that the business cycle could be considered momentarily inoperative. The entire twelve-item fragment for each intercensal year was "stepped up" by such a percentage as to establish between each December and the following January this standard relationship.[3] Having

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[1] The same method of analysis, applied to the census data for the dozen leading industrial states separately, shows that none was affected as was Massachusetts.

[2] First proposed by the writer in the *Special Letter* of Oct. 8, 1821, Harvard Economic Service.

[3] Two kinds of standard $\left(\frac{\text{January}}{\text{December}}\right)$ link relatives were utilized: (a) such a percentage as would precisely account for the residual fluctuation between consecutive census years, not accounted for by the course of the state bureaus' data *within* the intercensal years; also (b) the median of the known $\left(\frac{\text{January}}{\text{December}}\right)$ links for the period 1889–1906. The first of these is to be preferred, owing to changes in the degree of inclusiveness and in the slope of trend of the latter. Either method may lead to inaccuracy in determining any single transition between years, but on the average its results are not likely

thus interpolated the probable course of actual employment fluctuation between census years in these two states, the long-time trend, seasonal variation, and standard deviation were eliminated by an adaptation of the method devised by Professor Warren M. Persons,[1] yielding corrected cycles.

This method was applied to the Massachusetts data, first for cotton, then for all industries except cotton; the two resulting sets of cycles were combined on the basis of the relative importance of cotton manufacturing *in the entire country*. The same method was applied to all industries combined in New Jersey. Both curves are shown in Chart 4. Though derived wholly independently of each other, the results show a close correspondence; the correlation coefficient is 82 per cent. The only discrepancies are found in the abnormal year 1904, already discussed, and in such years as 1912 and 1913, when labor disputes in one state or the other caused temporary relapses.[2] In 1910 employment in Massachusetts was influenced both by labor disputes and by a short crop of cotton in the preceding year. With these minor exceptions, every important movement appears with almost equal clearness in the two indexes: the minor boom preceding the "rich men's panic" of 1903; the depression of 1904; the recovery and boom in 1905 and 1906; the relapse begun in July, 1907, and greatly accentuated by the panic of October–November; the beginning of recovery in June, 1908; the appearance and disappearance of the minor depression in 1910–11; the recovery in 1911–12; and the incipient depression of early 1913, continuing until after the outbreak of the war.[3]

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to be greatly in error; moreover, the use of the standard deviation (after Persons) lessens still further the chance of error in the final cycles.

In the view of the present writer such a method seems far superior to the use of external evidence for combining these fragments. It is possible but undesirable to resort to other data. In the first place, no continuous data actually measuring employment were available before the war, and it is hazardous to translate absolute changes in the continuous unemployment data into employment. Even if this be done in a reliable manner, it introduces a spurious similarity between the adjusted series and the reference series. Any comparison among the results would, in short, be fallacious, *i. e.*, it would involve reasoning in a circle. The same objection of course holds against the use of production data or other business indexes in lieu of employment as the basis for estimating December-to-January changes in employment.

For a different view of this whole matter, see Ralph G. Hurlin, "Three Decades of Employment Fluctuation," *The Annalist*, vol. 18, pp. 387–88, October 24, 1921.

[1] For Persons' explanation of his method, see *Rev. of Econ. Statis.*, prel. vol. 1, pp. 4–205, Jan. and Apr., 1919. The slight change made by the writer in the seasonal analysis was the use of an arithmetic rather than a geometric law for eliminating the secondary effect of trend from the seasonal chain relatives. The straight-line law simplifies the computation, and is also more in harmony with the general principle of using a straight line in measuring the long-time trend itself—a principle which Persons himself utilizes in that connection.

[2] Especially the great silk strike in Paterson, N. J., February–July, 1913.

[3] The end of depression in the winter of 1914–15 also appeared simultaneously in the two states. *Cf.* this JOURNAL, vol. XVIII, pp. 45, 50, Mar., 1922.

MEASURES OF UNEMPLOYMENT

Even more valuable evidence as to employment fluctuations can be obtained by examining the fluctuations in unemployment, "the other side of the shield." Before the war two unemployment series were available, one for Massachusetts and one for New York state. Each was reported in consistent form, without sudden changes from year to year as in the pay-roll data; consequently they had in common the important advantage of continuity. They are also broader in industrial scope, comprising not only manufacturing but also building, transportation, etc. Both of the unemployment series are valuable, but that for New York has a net advantage, being reported monthly rather than quarterly, extending over a pre-war period twice as long as that for Massachusetts, and covering a much more important and more favorably situated industrial state.[1]

It is of course impossible to utilize these figures in their original form,[2] owing especially to the effects of labor disputes, seasonal variation, and long-time trend, as well as the very important changes in industrial composition. Suitable analysis has eliminated these difficulties,[3] yielding the two unemployment indexes shown in Chart 5. The results are in close accord with each other, and with the adjusted pay-roll data.[4] The correlation coefficients are as follows: between the two unemployment indexes, +72 per cent; between New York unemployment and New Jersey employment, −73 per cent; between New York unemployment and Massachusetts employment, −80 per cent; between Massachusetts employment and unemployment, −88 per cent.

A GENERAL INDEX OF EMPLOYMENT AND UNEMPLOYMENT

We now have before us all the materials necessary for constructing a general index of employment cycles for the United States. The three states represented in Charts 4 and 5 comprise more than one fourth of all the industrial wage-earners in the United States.[5] The indexes appear to represent adequately the course of employment in the respective states. Although constructed entirely without reference

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[1] This JOURNAL, vol. XVIII, pp. 43–44.

[2] Compare Chart 4 with the charts of original items for these two series, shown by E. S. Bradford, "Methods Used in Measuring Unemployment," Quar. Pub. of the Amer. Stat. Ass'n, vol. XVII, pp. 991–93, Dec., 1921.

[3] The methods of analysis are fully described in *Rev. of Econ. Statis.*, prel. vol. 4, pp. 26–34, Jan., 1922.

[4] The discrepancy in 1904 is due to the facts already pointed out. The slightly earlier increase of unemployment in New York in 1907 is also attributable to business conditions, not to any peculiarity in the unemployment curve as such. Bank clearings in cities of New York state outside the metropolis follow in 1907 the same course as the inverted unemployment curve.

[5] New York, 15 per cent; Massachusetts, 8; and New Jersey, 5; a total of 28 per cent.

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CHART 4
EMPLOYMENT IN MASSACHUSETTS AND NEW JERSEY
(MONTHLY CYCLES: UNIT ONE STANDARD DEVIATION)
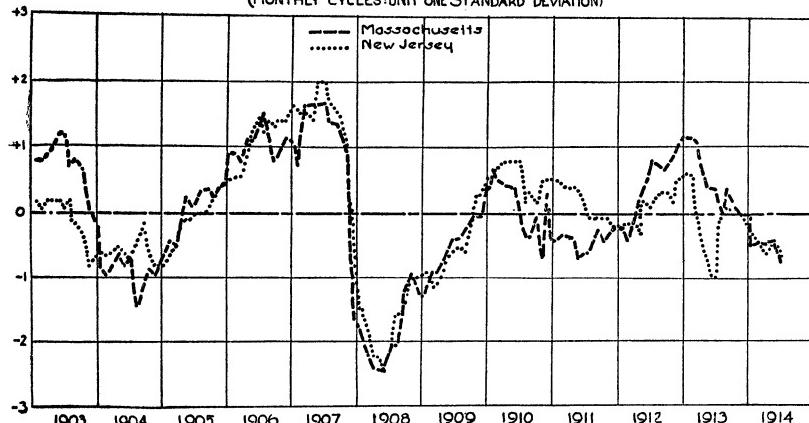
CHART 5
UNEMPLOYMENT IN NEW YORK STATE AND MASSACHUSETTS
(UNIT · ONE STANDARD DEVIATION)
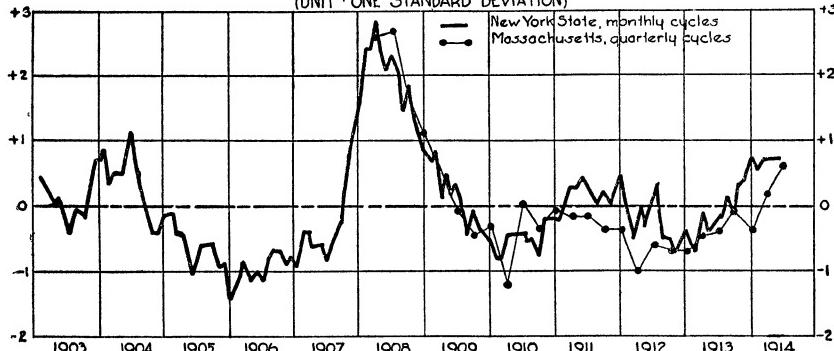
CHART 6
TWO COMBINATIONS OF EMPLOYMENT AND INVERTED UNEMPLOYMENT   (3 STATES)
(MONTHLY CYCLES;   UNIT : ONE STANDARD DEVIATION)
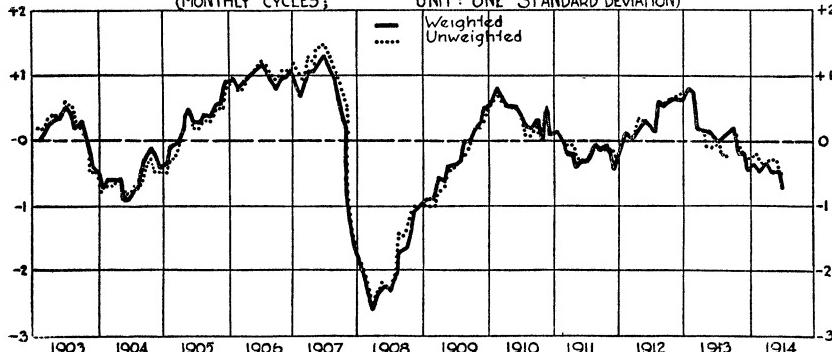
to one another, they support one another so thoroughly as to justify beyond any reasonable doubt a combination of the three.

Two such combinations[1] are presented in Chart 6. Both are based upon the two employment indexes and the New York unemployment index; the Massachusetts unemployment index, being quarterly, could not well be utilized in a monthly composite. In the weighted index the three components are assigned weights of five points (New York), three points (Massachusetts), and two points (New Jersey), proportional to the actual industrial importance of the three states, without penalizing the New Jersey and the Massachusetts data for their statistical and economic imperfections. If these be considered serious enough to justify reducing the two minor weights further, the combination would of course more closely resemble the inverse of the New York curve shown in Chart 5. Indeed, the reader who prefers to follow a strictly conservative policy may prefer to rely on the inverted New York index alone.[2] The question of weighting is, however, of slight importance in this case, owing to the similarity of the components. As a test of this, a simple average of the three has been constructed; this practically coincides with the 5–3–2 combination, as shown in Chart 6, giving a correlation coefficient of 99 per cent. The correlation between the unweighted combination and New York unemployment (inverted) is 94 per cent.

The continuous index of employment is strongly confirmed by the United States Census of Manufactures, before as well as since the war. Except in the industrially disordered year of 1904, the correlation coefficients have been consistently above 90 per cent—in 1909, 94 per cent, and in 1914, over 99 per cent. The post-war index has already been shown to have a correlation of 97 per cent. with the 1919 census.[3]

EMPLOYMENT AS AN INDEX OF INDUSTRIAL ACTIVITY; OTHER USES

Chart 7 shows an annual index, likewise constructed by weighting the New York, Massachusetts, and New Jersey data, on the 5–3–2 basis.[4]

[1] An earlier index has also been prepared, but it is omitted. It extends back to 1889, being based on the Massachusetts data alone until 1895, and on Massachusetts and New Jersey data between 1895 and 1902.

[2] See, for example, the *Rev. of Econ. Statis.*, prel. vol. 4, pp. 33–39, Jan., 1922. The weighted combination is presented in the table accompanying this article.

[3] *Supra*, p. 233. For the 1914 correlation the pre-war index was extended from June through December.

[4] Here the Massachusetts component for the years 1908–13 was obtained by taking the average of the employment and the reversed unemployment figures. To center the average of the quarterly unemployment cycles in the middle of the calendar year, a five-quarter rather than a four-quarter average was used: Dec. 31 of the previous year, and Jan. 31, Mar. 31, Sept. 30, and Dec. 31 of the current year.

The New York unemployment data are based upon the reports of all the unions in the state, rather than the representative selection (one-fourth to one-third as great) embodied in the monthly data. See *Rev. of Econ. Statis.*, prel. vol. 4, pp. 23, 24, Jan., 1922.

The curve is extended back to 1899, and is shown for comparison with Day's production index for all manufacture.[1]   The correlation is extraordinarily close, being represented by a coefficient of 86 per cent.

CHART 7
INDUSTRIAL EMPLOYMENT AND PRODUCTION
(ANNUAL CYCLES, UNIT ONE STANDARD DEVIATION)

Employment
Production of All Manufactures
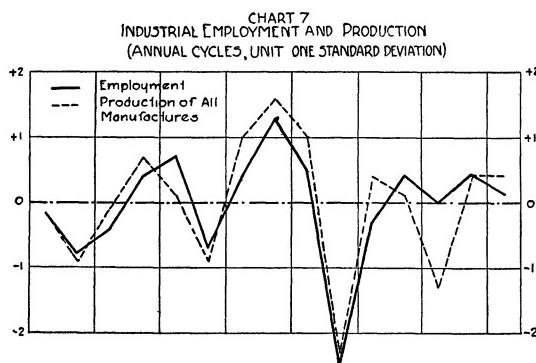
CHART 8
EMPLOYMENT AND PIGIRON PRODUCTION
(MONTHLY CYCLES ,   UNIT · ONE STANDARD DEVIATION)

Employment
Pigiron production

1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914
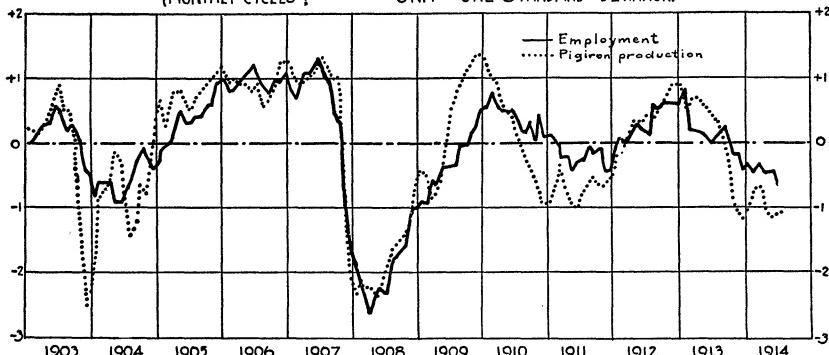
This agreement, close despite the differences in the source and the nature of the two groups of data, suggests the possibility of utilizing employment as an index of monthly production cycles prior to the war. Chart 8 shows the monthly index of employment, compared with pig iron production.[2]   Here, again, the agreement is very close (89 per cent).   In monthly form very few production series other than that for pig iron were available prior to the war, so that employment provides a much more comprehensive basis for picturing the monthly

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[1] Edmund E. Day, *An Index of the Physical Volume of Production*, pp. 62, 63.

[2] For the cycles of pig iron production see Warren M. Persons, "Indices of Business Conditions," *Rev. of Econ. Statis.*, prel. vol. I, pp. 104, 190–4, Jan. and Apr., 1919.

pre-war cycles of industrial production than can be obtained from direct evidence. The employment index covers not only a much wider variety of lines, but many more advanced stages of fabrication than could be represented in an index based on production data. Further substantiation is found in the relation of employment to other series representing the volume of activity, such as bank clearings outside New York City. There is conclusive evidence that employment affords a highly satisfactory index of industrial activity,[1] both before and since the war.

There are important differences in the *amplitudes* of indexes derived from the two sources, chiefly because of cyclical fluctuations in labor efficiency and in the volume of part-time and over-time employment.[2] But when inequalities of amplitude are eliminated by use of the standard deviation as a vertical unit, the *cycles* of activity appear practically the same, whether represented by employment or by production data.[2]

In conclusion attention should be called to other uses of the pre-war and the current indexes of employment. Properly analyzed, they have other economic uses than merely to afford a guide to cycles of productive activity. Employment cycles represent the course of the labor market. The employment manager can estimate the opportuneness of his labor policy by watching the course of employment, just as the financier can time his operations by following the fluctuations in the volume of loanable funds. When workers are already heavily employed we have a "tight" labor market; when employment is less full the labor market is "easy." In each case it is necessary, though not sufficient, to watch the course of prices or rates, i. e., wage-rates and money-rates; the available *volume* of labor and of capital should also be studied. On the commercial side also the employment cycle has economic significance. The writer has found that wage-rates normally lag nearly a year after employment in this country. That means that buying-power, a composite product of the volume of employment and wage-rates, also lags somewhat after employment. Employment forms a satisfactory first approximation to a barometer, or more strictly a forecaster, of pecuniary buying-power. The employment cycle is therefore of direct concern to the business man, whether he be interested chiefly in the labor market, in production, or in sales.

Not only the business man but also the social worker may find the study of the employment cycle of great practical value. Even though

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[1] Described in the *Rev. of Econ. Statis.*, prel. vol. 4, pp. 35–39, Jan., 1922. This and other significant relationships of the employment index will be presented more fully in a forthcoming monograph of the Pollak Foundation.

[2] For further treatment of these points see *Rev. of Econ. Statis.*, prel. vol. 4, pp. 17–19, Jan., 1922.

from some points of view it might be desirable to know the number of the unemployed, one may obtain much light as to the seriousness of the social situation at a given time by learning from an index the *relative intensity* of unemployment as compared with that at various times in the past. As contrasted with the usual method of estimating the volume of unemployment, the index has the two-fold advantage that it is probably more reliable, and that it establishes a norm in past experience for judging and interpreting the current employment situation. Some unpublished studies by the present writer seem to demonstrate a clear causal relationship between the business cycle and some eight or ten indexes reflecting social welfare. Undoubtedly a key element in the linkage by which the forces of the business cycle impinge upon general well-being is employment.

GENERAL INDEXES OF EMPLOYMENT IN THE UNITED STATES

(Unit: one-tenth of one standard deviation)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
(A) Pre-war Index												
1903......	0	+2	+3	+3	+4	+6	+4	+2	+3	0	+5	−5
1904......	−8	−6	−6	−6	−9	−9	−7	−6	−3	−1	−3	−4
1905......	−3	−1	0	+4	+5	+3	+3	+4	+4	+6	+6	+9
1906......	+10	+8	+9	+10	+11	+12	+11	+9	+8	+10	+10	+11
1907......	+8	+7	+11	+11	+12	+13	+11	+9	+6	+1	−8	−16
1908......	−20	−22	−26	−23	−22	−23	−20	−17	−16	−11	−10	−10
1909......	−9	−9	−6	−6	−4	−4	−3	0	0	+2	+3	+5
1910......	+6	+8	+6	+5	+5	+4	+2	+2	+3	0	+4	+1
1911......	+1	0	−2	−2	−4	−3	−3	−1	−2	−1	−2	−4
1912......	−1	+1	0	+2	+3	+2	+1	+6	+5	+6	+6	+6
1913......	+8	+8	+3	+2	+1	0	0	+1	+2	−2	−2	−4
1914......	−4	−4	−5	−4	−5	−6	....	....	....	....	....	....
(B) Current Index												
1914......	....	....	....	....	....	....	−11	−14	−11	−11	−15	−17
1915......	−16	−16	−16	−15	−13	−11	−11	−10	−7	−5	−4	−3
1916......	−3	−2	−1	+1	0	+2	+2	+4	+5	+6	+7	+6
1917......	+8	+7	+7	+5	+6	+6	+7	+6	+5	+7	+7	+8
1918......	+7	+6	+7	+6	+6	+6	+7	+10	+9	+8	+4	+5	+4
1919......	0	−4	−5	−4	−4	−1	+2	+4	+3	+1	+2	+5
1920......	+7	+6	+7	+8	+7	+7	+4	+5	+1	−1	−9	−16
1921......	−22	−20	−20	−20	−20	−19	−19	−18	−18	−16	−17	−17
1922......	−18	....	....	....	....	....	....	....	....	....	....	....